

Ventilator Management Basics: Modes, Settings, and Airway Pressures

THE QUESTION

Where the evidence disagrees

This topic was selected because an evidence synthesis beats a textbook on it: the trials disagree, or the guidance has moved recently.

THE EVIDENCE

What each source contributes, and how strong it is

Study design first — a cohort and a randomised trial do not carry the same weight.

Design	Year	Journal	What it found
Other	2019	Br J Anaesth	An international expert consensus recommends starting intraoperative ventilati
Other	2025	Br J Anaesth	Set the respiratory rate to the end-tidal CO ₂ and then resist the urge to keep
Other	2020	JAMA	Low tidal volume is not a charm you cast on its own — a randomised trial of 6
Other	2016	Lancet Respir Med	Plateau pressure minus PEEP is the driving pressure
Other	2008	Anesth Analg	Volume control promises a tidal volume, pressure control promises a pressure a
Other	2025	Anesth Analg	In a meta-analysis of 51 randomised trials in adults having abdominopelvic sur

10 resolved citations behind this deck; every point above traces to one of them.

IN PRACTICE

What the cohorts and reviews add

6 findings, each on the slide that follows.

BR J ANAESTH 2019

An international expert consensus recommends starting intraoperative ventilati

An international expert consensus recommends starting intraoperative ventilation at a tidal volume of 6 to 8 mL per kilogram of predicted body weight...

BR J ANAESTH 2025

Set the respiratory rate to the end-tidal CO₂ and then resist the urge to keep

Set the respiratory rate to the end-tidal CO₂ and then resist the urge to keep dialling it up, because in a pooled analysis of two large...

JAMA 2020

Low tidal volume is not a charm you cast on its own — a randomised trial of 6

Low tidal volume is not a charm you cast on its own — a randomised trial of 6 versus 10 mL/kg predicted body weight with PEEP of 5 in both arms found...

LANCET RESPIR MED 2016

Plateau pressure minus PEEP is the driving pressure

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IN PRACTICE

An international expert consensus recommends starting intraoperative ventilati

Other · Br J Anaesth

An international expert consensus recommends starting intraoperative ventilation at a tidal volume of 6 to 8 mL per kilogram of predicted body weight with PEEP of 5 cm H₂O, individualising PEEP thereafter and using the lowest effective pressure and fewest breaths when recruiting — which means the tidal volume is calculated from the patient's height, not from what the scale said.

Young et al., Br J Anaesth 2019 · PMID 31587835

IN PRACTICE

Set the respiratory rate to the end-tidal CO₂ and then resist the urge to keep

Other · Br J Anaesth

Set the respiratory rate to the end-tidal CO₂ and then resist the urge to keep dialling it up, because in a pooled analysis of two large intraoperative ventilation trials the patients whose end-tidal CO₂ ran below 4.7 kPa received higher weight-adjusted minute ventilation and developed more postoperative pulmonary complications (34% versus 23%), with an inverse linear relationship between mean end-tidal CO₂ and complications.

Nasa et al., Br J Anaesth 2025 · PMID 40930872

IN PRACTICE

Low tidal volume is not a charm you cast on its own — a randomised trial of 6

Other · JAMA

Low tidal volume is not a charm you cast on its own — a randomised trial of 6 versus 10 mL/kg predicted body weight with PEEP of 5 in both arms found no difference in postoperative pulmonary complications (38% versus 39%), while a Bayesian network meta-analysis found the benefit came from low tidal volume combined with moderate PEEP of 5 to 8 cm H₂O rather than from the small tidal volume alone.

Karalapillai et al., JAMA 2020 · PMID 32870298

IN PRACTICE

Plateau pressure minus PEEP is the driving pressure

Other · Lancet Respir Med

Plateau pressure minus PEEP is the driving pressure, and in an individual-patient meta-analysis of 17 randomised trials driving pressure was associated with postoperative pulmonary complications (odds ratio 1.16 per 1 cm H₂O) while tidal volume on its own was not; the gap between peak and plateau is a different quantity altogether — it is resistive, and it grows with airway resistance, smaller endotracheal tubes and shorter inspiratory times.

Neto et al., Lancet Respir Med 2016 · PMID 26947624

IN PRACTICE

Volume control promises a tidal volume, pressure control promises a pressure a

Other · Anesth Analg

Volume control promises a tidal volume, pressure control promises a pressure and assures neither the other, and pressure support only assists breaths the patient starts — and each has a catch worth knowing: the volume a traditional anaesthesia ventilator actually delivers in volume control is degraded by breathing-circuit compliance and fresh gas flow until the machine compensates for both, while adding pressure support to a spontaneously breathing patient with a laryngeal mask cut the postoperative fall in end-expiratory lung volume from about 17% to about 8%.

Bachiller et al., Anesth Analg 2008 · PMID 18420850

IN PRACTICE

In a meta-analysis of 51 randomised trials in adults having abdominopelvic sur

Other · Anesth Analg

In a meta-analysis of 51 randomised trials in adults having abdominopelvic surgery, second-generation supraglottic airways reduced major perioperative airway complications compared with tracheal tubes (risk ratio 0.41) with no clear difference in regurgitation or aspiration and much less sore throat, hoarseness and coughing, but they more than tripled the risk of inadequate ventilation (risk ratio 3.36) — so the supraglottic airway buys a quieter throat and the tube buys a ventilation you can count on.

de Carvalho et al., Anesth Analg 2025 · PMID 39466638

IN THE ROOM

What this changes about the next case

Colour is the strength of the evidence behind each step, not the urgency.

1

An international expert consensus recommends starting intraoperative ventilation at a tidal volume of 6 to 8 mL per kilogram of predicted body weight with PEEP of 5 cm H₂O, individualising PEEP thereafter and using the lowest effective pressure and fewest breaths when recruiting — which means the tidal volume is calculated from the patient's height, not from what the scale said.

2

Set the respiratory rate to the end-tidal CO₂ and then resist the urge to keep dialling it up, because in a pooled analysis of two large intraoperative ventilation trials the patients whose end-tidal CO₂ ran below 4.7 kPa received higher weight-adjusted minute ventilation and developed more postoperative pulmonary complications (34% versus 23%), with an inverse linear relationship between mean end-tidal CO₂ and complications.

3

Low tidal volume is not a charm you cast on its own — a randomised trial of 6 versus 10 mL/kg predicted body weight with PEEP of 5 in both arms found no difference in postoperative pulmonary complications (38% versus 39%), while a Bayesian network meta-analysis found the benefit came from low tidal volume combined with moderate PEEP of 5 to 8 cm H₂O rather than from the small tidal volume alone.

4

Plateau pressure minus PEEP is the driving pressure, and in an individual-patient meta-analysis of 17 randomised trials driving pressure was associated with postoperative pulmonary complications (odds ratio 1.16 per 1 cm H₂O) while tidal volume on its own was not; the gap between peak and plateau is a different quantity altogether — it is resistive, and it grows with airway resistance, smaller endotracheal tubes and shorter inspiratory times.

5

Volume control promises a tidal volume, pressure control promises a pressure and assures neither the other, and pressure support only assists breaths the patient starts — and each has a catch worth knowing: the volume a traditional anaesthesia ventilator actually delivers in volume control is degraded by breathing-circuit compliance and fresh gas flow until the machine compensates for both, while adding pressure support to a spontaneously breathing patient with a laryngeal mask cut the postoperative fall in end-expiratory lung volume from about 17% to about 8%.

KEY TAKEAWAYS

What to carry into the next case

An international expert consensus recommends starting intraoperative ventilati

Br J Anaesth 2019

Set the respiratory rate to the end-tidal CO₂ and then resist the urge to keep

Br J Anaesth 2025

Low tidal volume is not a charm you cast on its own — a randomised trial of 6

JAMA 2020

Plateau pressure minus PEEP is the driving pressure

Lancet Respir Med 2016

Set tidal volume off the patient's height rather than his weight, put PEEP on from the start, and read peak and plateau as two separate measurements — the gap between them belongs to the airway, the plateau belongs to the lung.

QUESTIONS I'LL ASK YOU IN THE ROOM

1. What is this patient's predicted body weight, and how far is it from what the scale said?
2. Peak went up and plateau barely moved — is that a lung problem or a tube problem, and how would you tell?
3. You are hyperventilating him to an end-tidal CO₂ of 28. What is that buying you, and what is it costing?
4. If this were a 40-minute knee arthroscopy instead, would you still put a tube in — and what would you give up if you did not?

ORAL BOARDS STEM

A 58-year-old man, 170 cm and 92 kg, is having a laparoscopic sigmoid colectomy. You have induced, given rocuronium, intubated with an 8.0 tube and confirmed the position. The examiner points at a blank ventilator screen and asks you to set it — mode, rate, tidal volume, PEEP — and to say where on that screen you would look to know whether your settings are being delivered. Then the surgeon insufflates, the peak pressure rises from 19 to 32, and the plateau moves from 15 to 19; the examiner asks what has just happened and what you would change.

Set tidal volume off the patient's height rather than his weight, put PEEP on from the start, and read peak and plateau as two separate measurements — the gap between them belongs to the airway, the plateau belongs to the lung.

SOURCES

- [1] Young et al., Br J Anaesth 2019 · PMID 31587835
- [2] Nasa et al., Br J Anaesth 2025 · PMID 40930872
- [3] Karalapillai et al., JAMA 2020 · PMID 32870298
- [4] Deng et al., Br J Anaesth 2020 · PMID 32007240
- [5] Neto et al., Lancet Respir Med 2016 · PMID 26947624
- [6] Ilia et al., Pediatr Crit Care Med 2020 · PMID 31688716
- [7] Bachiller et al., Anesth Analg 2008 · PMID 18420850
- [8] Sudy et al., Acta Anaesthesiol Scand 2024 · PMID 37923301

[9] de Carvalho et al., Anesth Analg 2025 · PMID 39466638
[10] Bernardini et al., Anaesthesia 2009 · PMID 19860753

DRAFT — NOT
APPROVED